

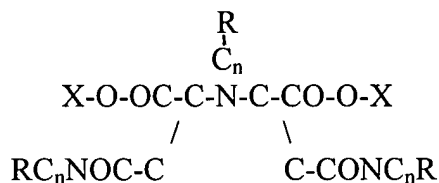
# AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

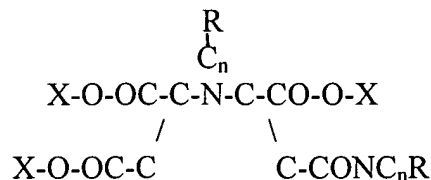
I claim:

1. (Canceled).
2. (Currently amended) A ~~chelating composition in combination with~~ fertilizer for application to soil, seeds, or plants, or fertilizer additives comprising at least one metal selected from the group consisting of calcium, magnesium, manganese, iron, cobalt, copper, zinc, molybdenum, and mixtures thereof, chelated with a, ~~said chelating composition comprising a modified iminodisuccinic acid, or a salt thereof, having one or more of the following formulas:~~

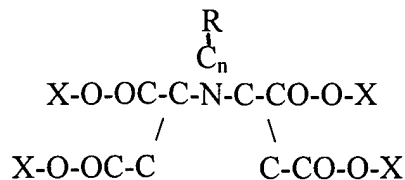
(a)



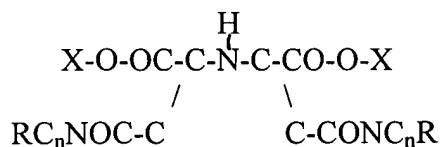
(b)



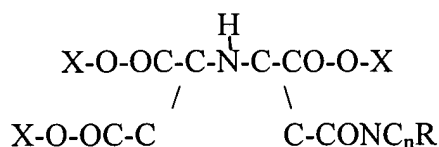
(c)



(d)



(e)



where X may be H, alkali, alkaline earth, ammonium-substituted radical, ammonium or transition metal;

where n may be 1 to 10; and

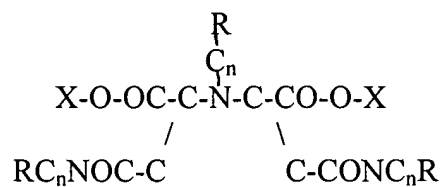
where R may be a Lewis base capable of donating a nonbonded pair of electrons,

prepared such that said chelating composition has at least six coordinating nonbonded electrons; and at least five of the nonbonded electron pairs may participate in coordination without steric hindrance or bond angle limitations.

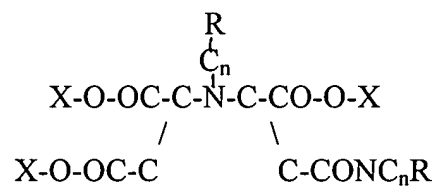
3. (Currently amended) A fertilizer for application to soils, seeds or plants comprising: water; at least one metal salt selected from the group consisting of the alkaline earth and transition metals, and inorganic Lewis bases or inorganic or organic amines or combinations, wherein the inorganic Lewis bases or inorganic or organic amines or combinations are selected from the group of polyfunctional amines consisting of organic alkylamines, allylamines, arylamines, diamines, hydroxylamines, polyamines, polyhydroxyamines, acid amines, and mixtures or derivatives thereof; and a chelating composition, for application to soils, seeds or plants, said chelating composition

comprising a modified iminodisuccinic acid, or a salt thereof, having one or more of the following formulas:

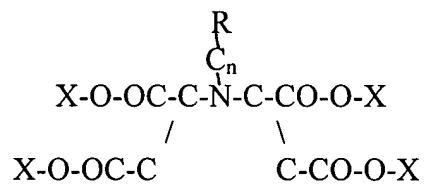
(a)



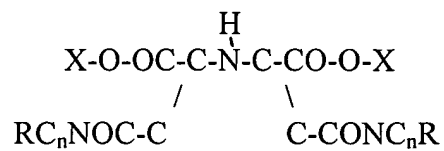
(b)



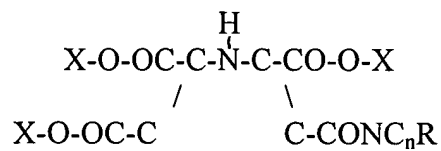
(c)



(d)



(e)



where X may be H, alkali, alkaline earth, ammonium-substituted radical, ammonium or transition metal;

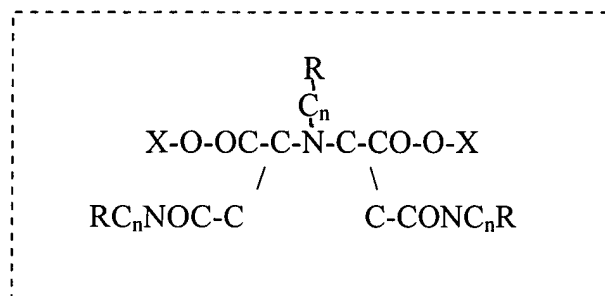
where n may be 1 to 10; and

where R may be a Lewis base capable of donating a nonbonded pair of electrons,

prepared such that said chelating composition has at least six coordinating nonbonded electrons; and at least five of the nonbonded electron pairs may participate in coordination without steric hindrance or bond angle limitations.

4.-11. (Canceled).

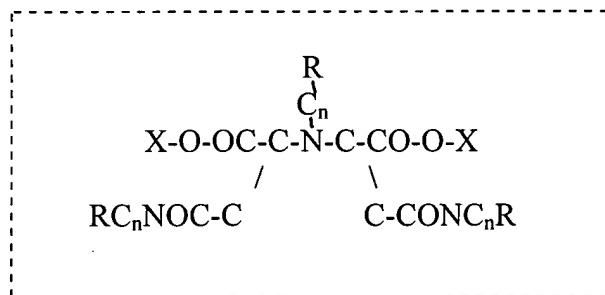
12. (Currently amended) A ~~compound used as a~~ fertilizer additive for application to soil, seeds, or plants, comprising a chelating composition having at least one poly functional substitution on iminodisuccinic acid having the following formula:



where X is H, alkali, alkaline earth, ammonium-substituted radical, ammonium or transition metal; n is 1 to 10, and R is a Lewis base capable of donating a nonbonded pair of electrons, wherein said compound is synthesized in a single reaction vessel at ambient pressure without the addition of heat, by a synthesis comprising the steps of:

(a) adding an acid anhydride or lactone to a first polyfunctional amine, and allowing same to react to form a N-polyfunctional acid common name amide; and

- (b) adding water, ~~Me(OH)~~alkali metal hydroxide, and a second polyfunctional amine to said N- polyfunctional acid common name amide and allowing same to react to form an imino di N- polyfunctional acid common name amide,  
such that said compound has at least six coordinating nonbonded electrons; and at least five of the nonbonded electron pairs may participate in coordination without steric hindrance or bond angle limitations.
13. (Currently amended) A fertilizer for application to soil, seeds, or plants, comprising water, ~~compound~~ used as at least one nutrient selected from the group consisting of nitrogen, phosphorus and potassium, and a chelating agent in a concentration of  $1/10^a$  to 1 part, where a is less than 10, or  $1.0 \times 10^{-9}$  Molar to 3Molar, wherein said ~~compound~~ chelating agent comprises at least one poly functional substitution on iminodisuccinic acid having the following formula:

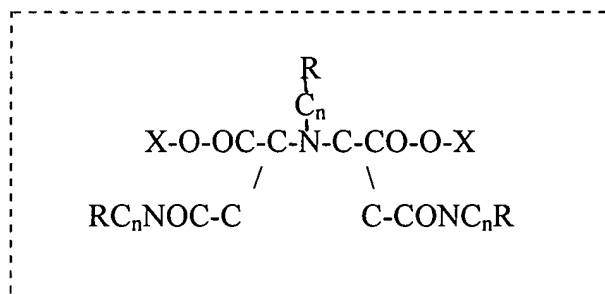


where X is H, alkali, alkaline earth, ammonium-substituted radical, ammonium or transition metal; n is 1 to 10, and R is a Lewis base capable of donating a nonbonded pair of electrons, and wherein said ~~compound~~ chelating agent is synthesized in a single reaction vessel at ambient pressure without the addition of heat, by a synthesis comprising the steps of:

- (a) adding an acid anhydride or lactone to a first polyfunctional amine, and allowing same to react to form a N-polyfunctional acid common name amide; and
- (b) adding water, Alkali metal hydroxide, and a second polyfunctional amine to said N-polyfunctional acid common name amide and allowing same to react to form an imino di N- polyfunctional acid common name amide,

such that said chelating agent has at least six coordinating nonbonded electrons; and at least five of the nonbonded electron pairs may participate in coordination without steric hindrance or bond angle limitations

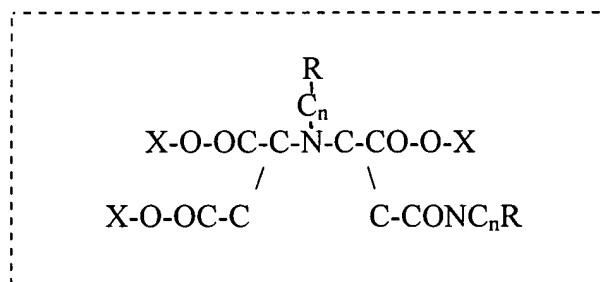
14. (Currently amended) A ~~compound~~ fertilizer used for application to soils, seed, or plants, wherein said ~~compound-fertilizer~~ comprises a chelating compound comprising at least one poly functional substitution on iminodisuccinic acid having the following formula:



where X is H, alkali, alkaline earth, ammonium-substituted radical, ammonium or transition metal; n is 1 to 10, and R is a Lewis base capable of donating a nonbonded pair of electrons, and wherein said compound is synthesized by a synthesis comprising the steps of:

- (a) adding an acid anhydride or lactone to a first polyfunctional amine, and allowing same to react to form a N-polyfunctional acid common name amide; and

- (b) adding water, ~~Me(OH)-~~alkali metal hydroxide, and a second polyfunctional amine to said N- polyfunctional acid common name amide and allowing same to react to form an imino di N- polyfunctional acid common name amide,  
such that said chelating compound has at least six coordinating nonbonded electrons; and at least five of the nonbonded electron pairs may participate in coordination without steric hindrance or bond angle limitations.
15. (Canceled).
16. (Currently amended) A ~~compound used as a fertilizer additive~~ fertilizer comprising a compound having at least one poly functional substitution on iminodisuccinic acid having the following formula:

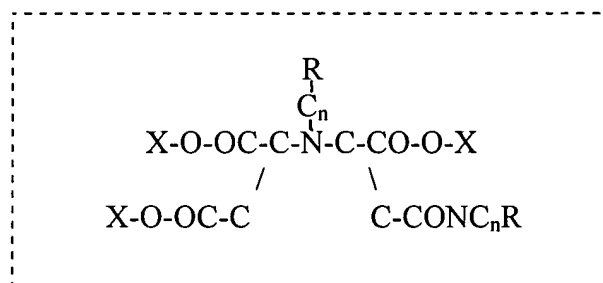


where X is H, alkali, alkaline earth, ammonium-substituted radical, ammonium or transition metal salts, n is 1 to 10, R is a Lewis base capable of donating a nonbonded pair of electrons, ~~and Me is selected from the alkali metals~~, and wherein the synthesis of said compound is in a single reaction vessel at ambient pressure without the addition of heat, and comprises the steps of:

- (a) adding an acid anhydride or lactone to a first polyfunctional amine, and allowing same to react to form a N- polyfunctional acid common name amide; and

(b) adding to said N- polyfunctional acid common name amide, water, a second polyfunctional amine, an acid anhydride or lactone, a ~~Me(OH)-alkali metal hydroxide~~, and allowing same to react to form said compound,  
such that said compound has at least six coordinating nonbonded electrons; and at least five of the nonbonded electron pairs may participate in coordination without steric hindrance or bond angle limitations.

17. (Currently amended) A fertilizer comprising compound ~~used as~~ a chelating agent in a concentration of  $1/10^a$  to 1 part, where  $a$  is less than 10, or  $1.0 \times 10^{-9}$  Molar to 3 Molar, said ~~compound~~ chelating agent comprising at least one poly functional substitution on iminodisuccinic acid having the following formula:



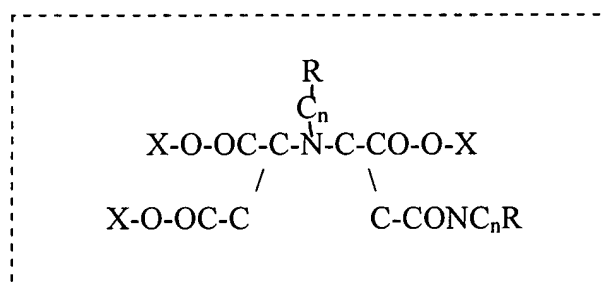
where X is H, alkali, alkaline earth, ammonium-substituted radical, ammonium or transition metal salts, n is 1 to 10, R is a Lewis base capable of donating a nonbonded pair of electrons, ~~and Me is selected from the alkali metals~~, wherein the synthesis of said ~~compound~~ chelating agent comprises the steps of:

- (a) adding an acid anhydride or lactone to a first polyfunctional amine, and allowing same to react to form a N- polyfunctional acid common name amide; and



(b) adding to said N- polyfunctional acid common name amide, water, a second polyfunctional amine, an acid anhydride or lactone, a ~~Me(OH)~~ an alkali metal hydroxide, and allowing same to react to form said ~~compound~~ chelating agent in a single reaction vessel at ambient pressure without the addition of heat.

18. (Currently amended) A compound used for application to soils, seed, or plants, in fertilizer, said compound comprising at least one poly functional substitution on iminodisuccinic acid having the following formula:



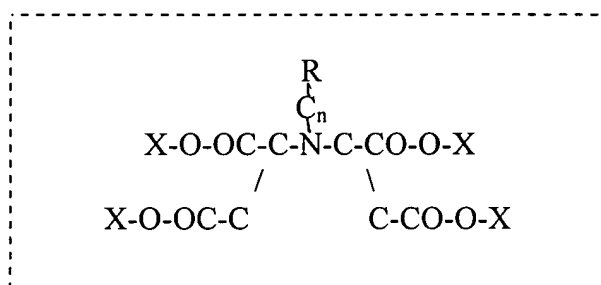
where X is H, alkali, alkaline earth, ammonium-substituted radical, ammonium or transition metal salts, n is 1 to 10, R is a Lewis base capable of donating a nonbonded pair of electrons, and Me is selected from the alkali metals, wherein the synthesis of said compound comprises the steps of:

- (a) adding an acid anhydride or lactone to a first polyfunctional amine, and allowing same to react to form a N- polyfunctional acid common name amide; and
- (b) adding to said N- polyfunctional acid common name amide, water, a second polyfunctional amine, an acid anhydride or lactone, a Me (OH), and allowing same to react to form said compound,

such that said compound has at least six coordinating nonbonded electrons; and at least five of the nonbonded electron pairs may participate in coordination of a mineral for fertilizer without steric hindrance or bond angle limitations.

19. (Canceled).

20. (Currently amended) A fertilizer additive comprising at least one poly functional substitution on iminodisuccinic acid having the following formula:

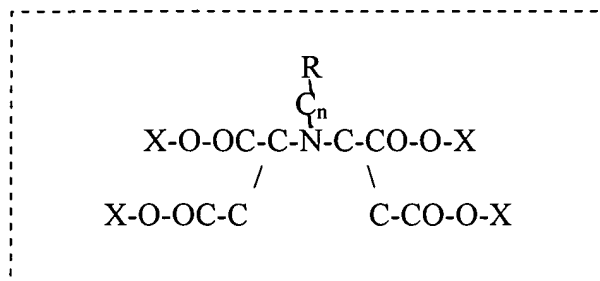


where X is H, alkali, alkaline earth, ammonium-substituted radical, ammonium or transition metal salts; where n is 1 to 10; where R is a Lewis base capable of donating a nonbonded pair of electrons, wherein the synthesis of said fertilizer additive comprises the steps of :

adding maleic anhydride or malic acid to Me (OH) + polyfunctional amine + water, and allowing same to react to form the N, N-disuccinylamino(:functional group)

such that said additive has at least six coordinating nonbonded electrons; and at least five of the nonbonded electron pairs may participate in coordination of a mineral for fertilizer without steric hindrance or bond angle limitations.

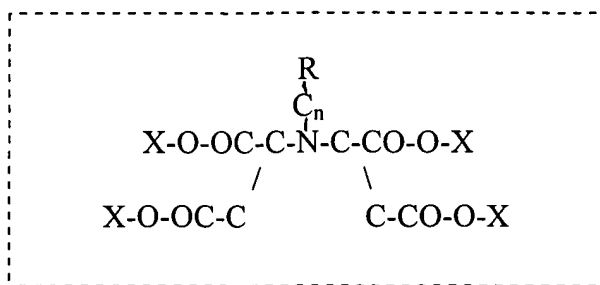
21. (Currently amended) A chelating agent in a concentration of  $1/10^a$  to 1 part, where a is less than 10, or, or  $1.0 \times 10^{-9}$  Molar to 3 Molar, wherein said chelating agent comprises at least one poly functional substitution on iminodisuccinic acid having the following formula:



where X is H, alkali, alkaline earth, ammonium-substituted radical, ammonium or transition metal salts; where n is 1 to 10; where R is a Lewis base capable of donating a nonbonded pair of electrons, and wherein the synthesis of said chelating agent comprises the steps of: adding maleic anhydride or malic acid to Me (OH) + polyfunctional amine + water, and allowing same to react to form the N, N-disuccinicamino(:functional group),

prepared such that said chelating agent has at least six coordinating nonbonded electrons; and at least five of the nonbonded electron pairs may participate in coordination of a mineral for fertilizer without steric hindrance or bond angle limitations, enabling the chelating agent to be useful in fertilizer.

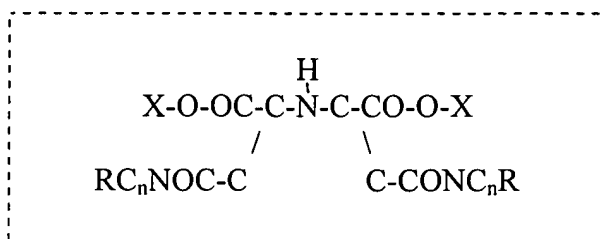
22. (Currently amended) A fertilizer compound used for application to soils, seed, or plants comprising at least one poly functional substitution on iminodisuccinic acid having the following formula:



where X is H, alkali, alkaline earth, ammonium-substituted radical, ammonium or transition metal salts;, where n is 1 to 10; where R is a Lewis base capable of donating a nonbonded pair of electrons, wherein the synthesis of said compound comprises the steps of: adding maleic anhydride or malic acid to Me (OH) + polyfunctional amine + water, and allowing same to react to form the N, N-disuccinamicamino(:functional group);  
wherein said compound has at least six coordinating nonbonded electrons; and at least five of the nonbonded electron pairs may participate in coordination of a mineral for fertilizer without steric hindrance or bond angle limitations.

23. (Canceled).

24. (Currently amended) A fertilizer additive comprising at least one poly functional substitution on iminodisuccinic acid having the following formula:



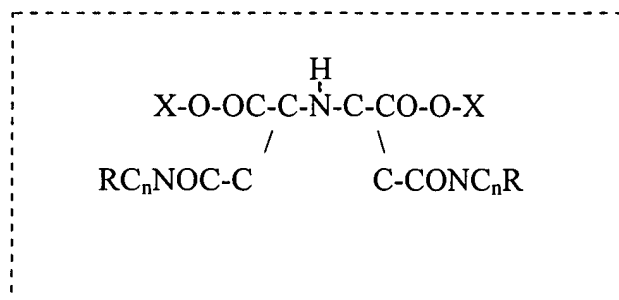
where X is H, alkali, alkaline earth, ammonium-substituted radical, ammonium or transition metal salts; where n is 1 to 10, where R is a Lewis base capable of donating a

nonbonded pair of electrons; wherein the synthesis of said fertilizer additive comprises the steps of :

- (a) adding acid anhydride or lactone to a first polyfunctional amine and allowing same to react to form a N- polyfunctional acid common name amide; and
- (b) adding to said N- polyfunctional acid common name amide, water + ammonia + Alkali metal hydroxide, and allowing same to react to form an N,N- amino polyfunctional acid common name amide,

such that said additive has at least six coordinating nonbonded electrons; and at least five of the nonbonded electron pairs may participate in coordination of a mineral for fertilizer without steric hindrance or bond angle limitations.

25. (Currently amended) A chelating agent in a concentration of  $1/10^a$  to 1 part, where a is less than 10, or  $1.0 \times 10^{-9}$  Molar to 3 Molar, said chelating agent comprising at least one poly functional substitution on iminodisuccinic acid having the following formula:



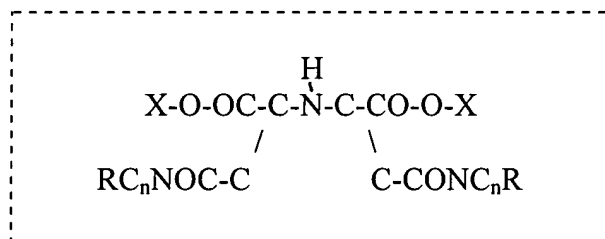
where X is H, alkali, alkaline earth, ammonium-substituted radical, ammonium or transition metal salts; where n is 1 to 10, where R is a Lewis base capable of donating a nonbonded pair of electrons; and wherein the synthesis of said chelating agent comprises the steps of :

(a) adding acid anhydride or lactone to a first polyfunctional amine and allowing same to react to form a N- polyfunctional acid common name amide; and

(b) adding to said N- polyfunctional acid common name amide, water + ammonia + Alkali metal hydroxide, and allowing same to react to form an N,N- amino polyfunctional acid common name amide,

such that said chelating agent has at least six coordinating nonbonded electrons; and at least five of the nonbonded electron pairs may participate in coordination of a mineral without steric hindrance or bond angle limitations.

26. (Currently amended) A compound used for application to soils, seed, or plants comprising at least one poly functional substitution on iminodisuccinic acid having the following formula:

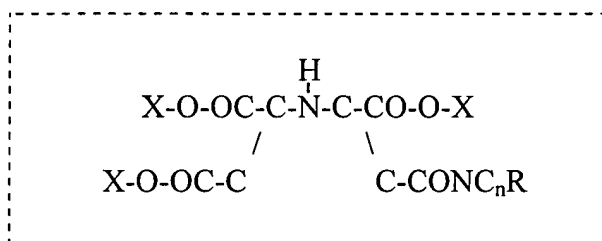


where X is H, alkali, alkaline earth, ammonium-substituted radical, ammonium or where X is H, alkali, alkaline earth, ammonium-substituted radical, ammonium or transition metal salts; where n is 1 to 10, where R is a Lewis base capable of donating a nonbonded pair of electrons; and wherein the synthesis of said compound comprises the steps of : (a) adding acid anhydride or lactone to a first polyfunctional amine and allowing same to react to form a N- polyfunctional acid common name amide; and (b) adding to said N-

polyfunctional acid common name amide, water + ammonia + Me(OH), and allowing same to react to form an N,N- amino polyfunctional acid common name amide, such that said compound has at least six coordinating nonbonded electrons; and at least five of the nonbonded electron pairs may participate in coordination of a mineral without steric hindrance or bond angle limitations.

27. (Canceled).

28. (Currently amended) A fertilizer additive comprising at least one poly functional substitution on iminodisuccinic acid having the following formula:

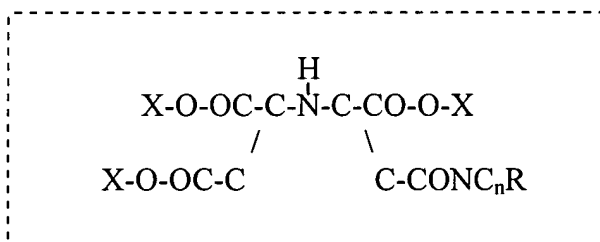


where X may be H, alkali, alkaline earth, ammonium-substituted radical, ammonium or transition metal; where n may be 1 to 10; where R may be a Lewis base capable of donating a nonbonded pair of electrons; wherein the synthesis of said fertilizer additive comprises the steps of:

- (a) adding an acid anhydride or lactone to a first polyfunctional amine and allowing same to react to form an N- polyfunctional acid common name amide;
- (b) adding to said N- polyfunctional acid common name amide, water, ammonia + maleic anhydride or maleic acid (salt) and allowing same to react to form said fertilizer additive,

such that said additive has at least six coordinating nonbonded electrons; and at least five of the nonbonded electron pairs may participate in coordination of a mineral for fertilizer without steric hindrance or bond angle limitations.

29. (Currently amended) A chelating agent[s] in a concentration[s] of  $1/10^a$  to 1part, where a is less then 10, or  $1.0 \times 10^{-9}$  Molar to 3 Molar, said chelating agent comprising at least one poly functional substitution on iminodisuccinic acid having the following formula:



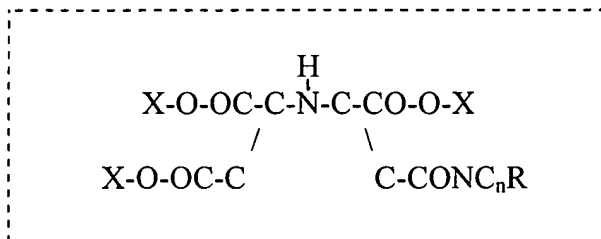
where X may be H, alkali, alkaline earth, ammonium-substituted radical, ammonium or transition metal; where n may be 1 to 10; where R may be a Lewis base capable of donating a nonbonded pair of electrons; wherein the synthesis of said chelating agent comprises the steps of:

- (a) adding an acid anhydride or lactone to a first polyfunctional amine and allowing same to react to form an N- polyfunctional acid common name amide;
- (b) adding to said N- polyfunctional acid common name amide, water, ammonia + maleic anhydride or maleic acid (salt) and allowing same to react to form said chelating agent,

prepared such that said chelating agent has at least six coordinating nonbonded electrons; and at least five of the nonbonded electron pairs may participate in coordination of a mineral without steric hindrance or bond angle limitations.



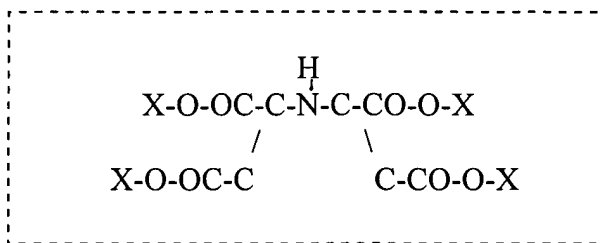
30. (Currently amended) A compound used for application to soils, seed, or plants, said compound comprising at least one poly functional substitution on iminodisuccinic acid having the following formula:



where X may be H, alkali, alkaline earth, ammonium-substituted radical, ammonium or transition metal; where n may be 1 to 10; where R may be a Lewis base capable of donating a nonbonded pair of electrons; wherein the synthesis of said compound comprises the steps of:

- (a) adding an acid anhydride or lactone to a first polyfunctional amine and allowing same to react to form an N- polyfunctional acid common name amide;
- (b) adding to said N- polyfunctional acid common name amide, water, ammonia + maleic anhydride or maleic acid (salt) and allowing same to react to form said compound, prepared such that said compound has at least six coordinating nonbonded electrons; and at least five of the nonbonded electron pairs may participate in coordination of a mineral without steric hindrance or bond angle limitations.

31. (Canceled).
32. (Currently amended) A fertilizer additive comprising iminodisuccinic acid having the following formula:

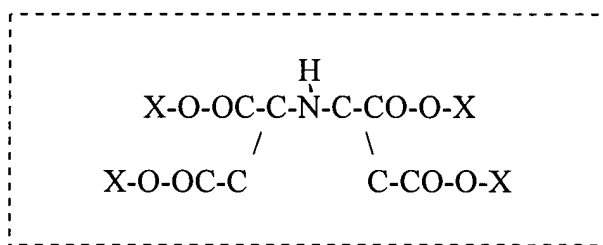


where X is H, alkali, alkaline earth, ammonium-substituted radical, ammonium or transition metal salt,

prepared such that said additive has at least six coordinating nonbonded electrons; and at least five of the nonbonded electron pairs may participate in coordination of a mineral for fertilizer without steric hindrance or bond angle limitations.

33. (Canceled).

34. (Currently amended) An iminodisuccinic acid used for application to soils, seed, or plants having the following formula:



where X is H, alkali, alkaline earth, ammonium-substituted radical, ammonium or transition metal salt,

prepared such that said acid has at least six coordinating nonbonded electrons; and at least five of the nonbonded electron pairs may participate in coordination of a mineral for fertilizer without steric hindrance or bond angle limitations.

35. Canceled.